

# FREE-OPERANT AVOIDANCE CONDITIONING IN HUMAN SUBJECTS<sup>1</sup>

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Previous research with animals has shown that an avoidance response can be established and maintained without the use of an exteroceptive warning stimulus (Sidman, 1953a, 1953b). The procedure involves presentation of a brief electric shock at periodic intervals, the shock-shock (S-S) interval. The animal's lever-pressing response delays the onset of shock by a second interval, the response-shock (R-S) interval, which may be less than, equal to, or greater than the interval between successive shocks. Such a technique results in stable rates of response which vary with the S-S and R-S intervals. The present study was undertaken to determine the feasibility of using this technique of free-operant avoidance conditioning with human subjects.

## METHOD

The subjects (Ss) were 36 male medical and graduate students between the ages of 21 and 29. These were volunteers who were told only that they would be paid three dollars to serve as research subjects for a period which might range from 10 minutes to 3 hours. When Ss arrived for the experiment, they were told that they would be taken to another room, that they would be seated in a chair, and that electrodes would be attached to their legs. They were instructed not to get up from or move the chair, nor touch the electrodes. They were also asked not to smoke or vocalize, and were told that the experimenter would be in the next room. At no time were Ss told anything of the nature of the experiment.

Each S was then taken to a small room and seated in front of a table. A red button on a wooden board was fastened to the edge of the table, directly in front of S. EKG-type electrodes were affixed to the calf of S's left leg. Apparatus controlling the conditioning regimen was located in an adjoining room from which observations of S's behavior could be made via a one-way glass screen.

The Ss were randomly assigned to one of three groups, each of which received an electric shock for 0.5 second at S-S intervals of either 5, 10, or 20 seconds. Electric current was set at that intensity which evoked an involuntary leg flexion. The Ss' most common response was that the shock was "unpleasant," "uncomfortable," or "bothersome." Only R-S intervals equal to the S-S intervals could be programmed, so that when S pressed the button the shock was delayed

by 5, 10, and 20 seconds for the respective S-S groups. Each conditioning period lasted 90 minutes unless S had removed the electrodes earlier.

The arbitrarily chosen criterion for acquisition of the avoidance response varied with the S-S and R-S intervals. For S-S = R-S = 5 seconds, the criterion was a 5-minute period during which S made a minimum of 60 responses and received no more than 10 shocks. For S-S = R-S = 10 seconds, the requirement was a minimum of 30 responses and no more than 5 shocks; and for S-S = R-S = 20 seconds, a minimum of 15 responses and no more than 3 shocks was required during a 5-minute period. The point at which S was considered to have acquired the avoidance response was the beginning of the 5-minute period during which the criterion was achieved.

## RESULTS

Because we were using human subjects, we anticipated that all Ss would acquire the avoidance response within a relatively short period of time and that differences among individuals within and between the different S-S and R-S intervals would be reflected in differing rates of response. Of the 36 Ss, 17 reached the acquisition criterion. Of the 19 Ss who failed to reach the acquisition criterion, 10 found the situation sufficiently "stressful" (reported as anxiety, fear, or anger-provoking) to remove the electrodes themselves and "walk out" of the experiment. Of the remaining 9 Ss, 7 did not make a single response in the 90-minute session. There were no differences among the three groups in the proportion of Ss who did or did not acquire the avoidance response.

The 17 Ss who reached the criterion of acquisition did so after periods ranging from 25 seconds to approximately 28 minutes. The median times required by the three groups, considering only those who reached the criterion, were not significantly different from each other.

Stability of response was defined by a 25-minute period taken at a point beginning midway between the time of acquisition and the end of the conditioning session. The rate of response for a given S was highly stable (Fig. 1). Some Ss, however, responded at a rate which barely exceeded that minimally required to avoid shock at the prevailing S-S and R-S interval; others had a stable rate approximately twice that required for consistent avoidance; and one individual (at S-S = R-S = 10 seconds) responded at a rate 15 times faster than that minimally required. In keeping with the high resistance to extinction characteristic of avoidance behavior, we observed few Ss who purposely

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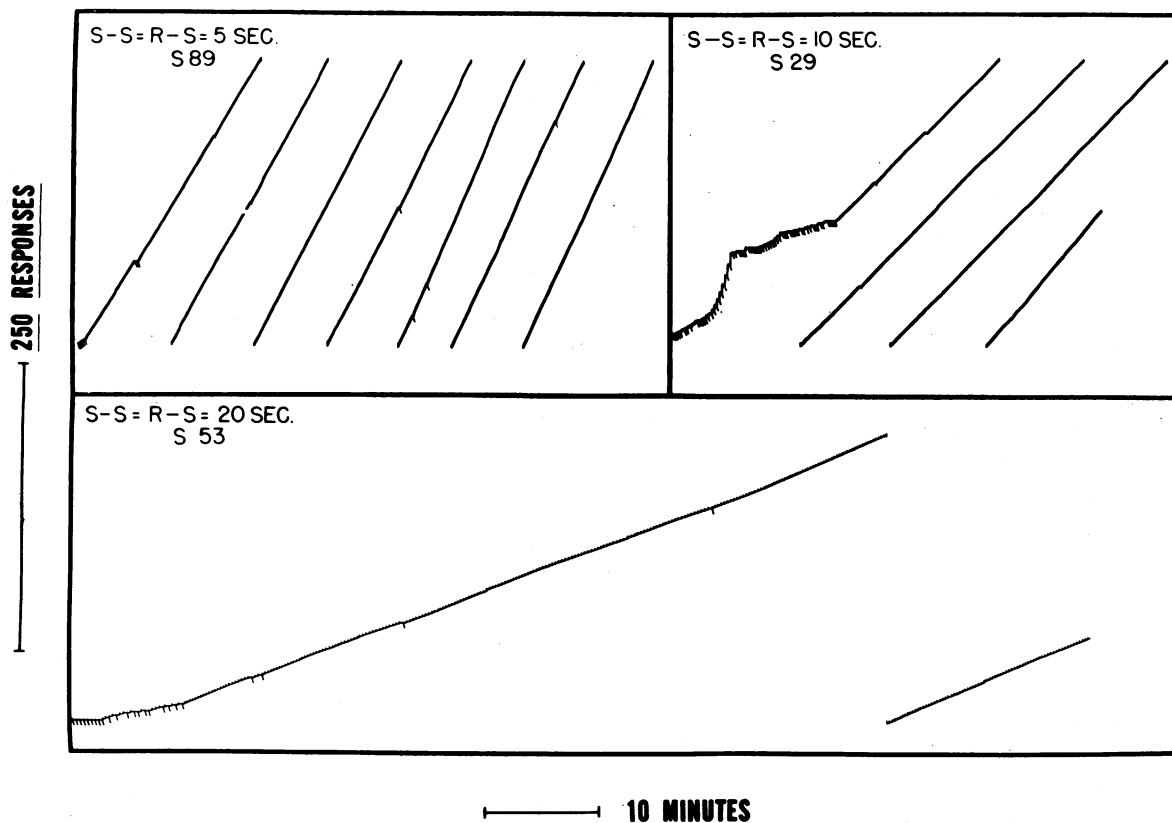


Fig. 1. Cumulative-response curves for representative Ss at S-S = R-S = 5, 10, and 20 seconds.

delayed a response in order to "... see if the shock was still there."

The cumulative-response curves selected to show the stability of response rate (Fig. 1) were chosen as representative of the Ss in that particular S-S = R-S group who acquired the avoidance response. Except for the one S mentioned above at the 10-second intervals and one S at the 20-second intervals, there was no overlap in the stable rates of response of individuals in each of the three groups. This tendency for response rate to vary with the S-S = R-S intervals can also be seen in the curves of Fig. 1.

#### DISCUSSION

On the basis of this preliminary work, the free-operant avoidance technique appears to be applicable to the study of human behavior. When given little more in the way of instructions than is possible to give animal subjects, human Ss show qualitative and quantitative differences in performance. By qualitative differences, we refer to the fact that approximately half our subjects failed to acquire the button-pressing avoidance

response. Some of these Ss remained in the situation and some "walked out." The reasons for such results are not yet clear and will receive further attention.

#### SUMMARY

The technique of conditioning an avoidance response without the use of an exteroceptive stimulus to signal forthcoming noxious stimulation was found to be applicable to human subjects. Of 36 subjects, 17 reached a predetermined criterion of acquisition and maintained their responses at a stable rate which appeared to vary with the prevailing S-S = R-S interval.

#### REFERENCES

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